

INTRODUCTION

The overall goals of water quality regulation are to protect and maintain thriving aquatic ecosystems and the resources those systems provide to society and to accomplish these in an economically and socially sound manner. California's regulatory framework uses water quality objectives both to define appropriate levels of environmental quality and to control activities that can adversely affect aquatic systems.

WATER QUALITY OBJECTIVES There are two types of objectives: narrative and numerical. Narrative objectives present general descriptions of water quality that must be attained through pollutant control measures and watershed management. They also serve as the basis for the development of detailed numerical objectives.

Historically, numerical objectives were developed primarily to limit the adverse effect of pollutants in the water column. Two decades of regulatory experience and extensive research in environmental science have demonstrated that beneficial uses are not fully protected unless pollutant levels in all parts of the aquatic system are also monitored and controlled. The Regional Board is actively working towards an integrated set of objectives, including numerical sediment objectives, that will ensure the protection of all current and potential beneficial uses.

Numerical objectives typically describe pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses (as described in Chapter 2).

The technical bases of the region's water quality objectives include extensive biological, chemical, and physical partitioning information reported in the scientific literature, national water quality criteria, studies conducted by other agencies, and information gained from local environmental and discharge monitoring (as described in Chapter 6). The Regional Board recognizes that limited information exists in some cases, making it difficult to establish definitive numerical objectives, but the Regional Board believes its

conservative approach to setting objectives has been proper. In addition to the technical review, the overall feasibility of reaching objectives in terms of technological, institutional, economic, and administrative factors is considered at many different stages of objective derivation and implementation of the water quality control plan.

Together, the narrative and numerical objectives define the level of water quality that shall be maintained within the region. In instances where water quality is better than that prescribed by the objectives, the state Antidegradation Policy applies (State Board Resolution 68-16: Statement of Policy With Respect to Maintaining High Quality of Waters in California). This policy is aimed at protecting relatively uncontaminated aquatic systems where they exist and preventing further degradation.

When uncontrollable water quality factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, the Regional Board will conduct a case-by-case analysis of the benefits and costs of preventing further degradation. In cases where this analysis indicates that beneficial uses will be adversely impacted by allowing further degradation, then the Regional Board will not allow controllable water quality factors to cause any further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled.

QUICK INDEX	PAGE
Water Quality Objectives for:	
Ocean Waters	3-2
Surface Waters.....	3-2
Groundwaters.....	3-5
The Delta and Suisun Marsh	3-7
Alameda Creek Watershed.....	3-7

The Regional Board establishes and enforces waste discharge requirements for point and nonpoint source of pollutants at levels necessary to meet numerical and narrative water quality objectives. In setting waste discharge requirements, the Regional Board will consider, among other things, the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives.

In general, the objectives are intended to govern the concentration of pollutant constituents in the main water mass. The same objectives cannot be applied at or immediately adjacent to submerged effluent discharge structures. Zones of initial dilution within which higher concentrations can be tolerated will be allowed for such discharges.

For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from submerged outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing. Initial dilution in this case is completed when the diluting wastewater ceases to rise in the water column and first begins to spread horizontally.

For shallow water submerged discharges, surface discharges, and nonbuoyant discharges, characteristic of cooling water wastes and some individual discharges, turbulent mixing results primarily from the momentum of discharge. Initial dilution, in these cases, is considered to be completed when the momentum-induced velocity of the discharge ceases to produce significant mixing of the waste, or the diluting plume reaches a fixed distance from the discharge to be specified by the Regional Board, whichever results in the lower estimate for initial dilution.

Compliance with water quality objectives may be prohibitively expensive or technically impossible in some cases. The Regional Board will consider modification of specific water quality objectives as long as the discharger can demonstrate that the alternate objective will protect existing beneficial uses, is scientifically defensible, and is consistent with the state Antidegradation Policy. This exception clause properly indicates that the Regional Board will conservatively compare benefits and costs in these cases because of the difficulty in quantifying beneficial uses.

These water quality objectives are considered necessary to protect the present and

potential beneficial uses described in Chapter 2 of this Plan and to protect existing high quality waters of the state. These objectives will be achieved primarily through establishing and enforcing waste discharge requirements and by implementing this water quality control plan.

OBJECTIVES FOR OCEAN WATERS

The provisions of the State Board's "Water Quality Control Plan for Ocean Waters of California" (Ocean Plan) and "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California" (Thermal Plan) and any revision to them will apply to ocean waters. These plans describe objectives and effluent limitations for ocean waters.

OBJECTIVES FOR SURFACE WATERS

The following objectives apply to all surface waters within the region, except the Pacific Ocean.

BACTERIA

Table 3-1 provides a summary of the bacterial water quality objectives and identifies the sources of those objectives. Table 3-2 summarizes U.S. EPA's water quality criteria for water contact recreation based on the frequency of use a particular area receives. These criteria will be used to differentiate between pollution sources or to supplement objectives for water contact recreation.

BIOACCUMULATION

Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

BIOSTIMULATORY SUBSTANCES

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Changes in chlorophyll a and associated phytoplankton communities follow complex dynamics that are sometimes associated with a discharge of biostimulatory substances. Irregular and extreme levels of chlorophyll a

or phytoplankton blooms may indicate exceedance of this objective and require investigation.

COLOR

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

DISSOLVED OXYGEN

For all tidal waters, the following objectives shall apply:

In the Bay:

Downstream of
Carquinez Bridge.....5.0 mg/l minimum

Upstream of
Carquinez Bridge.....7.0 mg/l minimum

For nontidal waters, the following objectives shall apply:

Waters designated as:

Cold water habitat.....7.0 mg/l minimum

Warm water habitat.....5.0 mg/l minimum

The median dissolved oxygen concentration for any three consecutive months shall not be less than 80 percent of the dissolved oxygen content at saturation.

Dissolved oxygen is a general index of the state of the health of receiving waters. Although minimum concentrations of 5 mg/l and 7 mg/l are frequently used as objectives to protect fish life, higher concentrations are generally desirable to protect sensitive aquatic forms. In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists. A three-month median objective of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water.

FLOATING MATERIAL

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

OIL AND GREASE

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

POPULATION AND COMMUNITY ECOLOGY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce significant alterations in population or community ecology or receiving water biota. In addition, the health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

pH

The pH shall not be depressed below 6.5 nor raised above 8.5. This encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 units in normal ambient pH levels.

SALINITY

Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to adversely affect beneficial uses, particularly fish migration and estuarine habitat.

SEDIMENT

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Controllable water quality factors shall not cause a detrimental increase in the concentrations of toxic pollutants in sediments or aquatic life.

SETTLEABLE MATERIAL

Waters shall not contain substances in concentrations that result in the deposition of material that cause nuisance or adversely affect beneficial uses.

SUSPENDED MATERIAL

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

SULFIDE

All water shall be free from dissolved sulfide concentrations above natural background levels. Sulfide occurs in Bay muds as a result of bacterial action on organic matter in an anaerobic environment.

Concentrations of only a few hundredths of a milligram per liter can cause a noticeable odor or be toxic to aquatic life. Violation of the sulfide objective will reflect violation of dissolved oxygen objectives as sulfides cannot exist to a significant degree in an oxygenated environment.

TASTES AND ODORS

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.

TEMPERATURE

Temperature objectives for enclosed bays and estuaries are as specified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California," including any revisions to the plan.

In addition, the following temperature objectives apply to surface waters:

- The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
- The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature.

TOXICITY

All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median of less than 90 percent survival, or less than 70 percent survival, 10 percent of the time, of test organisms in a 96-hour static or continuous flow test.

There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population, or community.

Chronic toxicity generally results from exposures to pollutants exceeding 96 hours. However, chronic toxicity may also be detected through short-term exposure of critical life stages of organisms.

As a minimum, compliance will be evaluated using the bioassay requirements contained in Chapter 4.

The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

TURBIDITY

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases from normal background light penetration or turbidity relating to waste discharge shall not be greater than 10 percent in areas where natural turbidity is greater than 50 NTU.

UN-IONIZED AMMONIA

The discharge of wastes shall not cause receiving waters to contain concentrations of un-ionized ammonia in excess of the following limits (in mg/l as N):

Annual Median	0.025
Maximum, Central Bay (as depicted in Figure 2-5) and upstream.....	0.16
Maximum, Lower Bay (as depicted in Figures 2-6 and 2-7)	0.4

The intent of this objective is to protect against the chronic toxic effects of ammonia in the receiving waters. An ammonia objective is needed for the following reasons:

- Ammonia (specifically un-ionized ammonia) is a demonstrated toxicant. Ammonia is generally accepted as one of the principle toxicants in municipal waste discharges. Some industries also discharge significant quantities of ammonia.
- Exceptions to the effluent toxicity limitations in Chapter 4 of the Plan allow for the discharge of ammonia in toxic amounts. In most instances, ammonia will be diluted or degraded to a nontoxic state fairly rapidly. However, this does not occur in all cases, the South Bay being a notable example. The ammonia limit is recommended in order to preclude any build up of ammonia in the receiving water.

- A more stringent maximum objective is desirable for the northern reach of the Bay for the protection of the migratory corridor running through Central Bay, San Pablo Bay, and upstream reaches.

OBJECTIVES FOR SPECIFIC CHEMICAL CONSTITUENTS

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use. Water quality objectives for selected toxic pollutants developed in 1986 for surface waters are given in Tables 3-3 and 3-4.

The Regional Board intends to work towards the derivation of site-specific objectives for the Bay-Delta estuarine system. Site-specific objectives to be considered by the Regional Board shall be developed in accordance with the provisions of the federal Clean Water Act, the State Water Code, State Board water quality control plans, and this Plan. These site-specific objectives will take into consideration factors such as all available scientific information and monitoring data and the latest U.S. EPA guidance, and local environmental conditions and impacts caused by bioaccumulation. Copper, mercury, PCBs, and selenium will be the highest priorities in this effort. Pending the adoption of site-specific objectives, the objectives in Tables 3-3 and 3-4 apply throughout the region.

Based on the concerns raised in the Regional Monitoring Program, pilot fish contamination study, cooperative striped bass study, and other studies, water quality objectives for aromatic hydrocarbons are also needed.

The South Bay below the Dumbarton Bridge is a unique, water-quality-limited, hydrodynamic and biological environment that merits continued special attention by the Regional Board. Site-specific water quality objectives are absolutely necessary in this area for two reasons. First, its unique hydrodynamic environment dramatically affects the environmental fate of pollutants. Second, potentially costly nonpoint source pollution control measures must be implemented to attain any objectives for this area. The costs of those measures must be factored into economic impact considerations by the Regional Board in adopting any objectives for this area. Nowhere else in the region will nonpoint source economic considerations have such an impact on the attainability of objectives. Therefore, for this area, the objectives contained in Tables 3-3 and 3-4 will be considered

guidance only, and should be used as part of the basis for site-specific objectives. Programs described in Chapter 4 will be used to develop site-specific objectives. Ambient conditions shall be maintained until site-specific objectives are developed.

CONSTITUENTS OF CONCERN FOR MUNICIPAL AND AGRICULTURAL WATER SUPPLIES

At a minimum, surface waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (SMCLs-Consumer Acceptance Limits) and 64449-B (SMCLs-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. Table 3-5 contains water quality objectives for municipal supply, including the MCLs contained in various sections of Title 22 as of the adoption of this plan.

At a minimum, surface waters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

RADIOACTIVITY

Radionuclides shall not be present in concentrations that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in Table 4 of Section 64443 (Radioactivity) of Title 22 of the California Code of Regulations, which is incorporated by reference into this Plan. This incorporation is prospective, including future changes to the incorporated provisions as the changes take effect (see Table 3-5).

OBJECTIVES FOR GROUNDWATERS

Groundwater objectives consist primarily of narrative objectives combined with a limited number of numerical objectives. Additionally, the Regional Board will establish basin-

and/or site-specific numerical groundwater objectives as necessary. For example, the Regional Board has groundwater basin-specific objectives for the Alameda Creek watershed above Niles to include the Livermore-Amador Valley as shown in Table 3-7.

The maintenance of existing high quality of groundwater (i.e., "back-ground") is the primary groundwater objective.

In addition, at a minimum, groundwaters shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of the objectives described below unless naturally occurring background concentrations are greater.

BACTERIA

In groundwaters with a beneficial use of municipal and domestic supply, the median of the most probable number of coliform organisms over any seven-day period shall be less than 1.1 MPN/100 mL (based on multiple tube fermentation technique; equivalent test results based on other analytical techniques as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21 (f), revised June 10, 1992, are acceptable).

ORGANIC AND INORGANIC CHEMICAL CONSTITUENTS

All groundwaters shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. To evaluate compliance with water quality objectives, the Regional Board will consider all relevant and scientifically valid evidence, including relevant and scientifically valid numerical criteria and guidelines developed and/or published by other agencies and organizations (e.g., U.S. EPA, the State Water Resources Control Board, California Department of Health Services, U.S. Food and Drug Administration, National Academy of Sciences, Cal/EPA Office of Environmental Health Hazard Assessment, U.S. Agency for Toxic Substances and Disease Registry, Cal/EPA Department of Toxic Substances Control, and other appropriate organizations.)

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of constituents in excess of the maximum (MCLs) or secondary maximum contaminant levels (SMCLs) specified in the following provisions of Title 22 of the California Code of

Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, and Table 64444-A (Organic Chemicals) of Section 64444. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

Groundwaters with a beneficial use of agricultural supply shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. In determining compliance with this objective, the Regional Board will consider as evidence relevant and scientifically valid water quality goals from sources such as the Food and Agricultural Organizations of the United Nations; University of California Cooperative Extension, Committee of Experts; and McKee and Wolf's "Water Quality Criteria," as well as other relevant and scientifically valid evidence. At a minimum, groundwaters designated for use as agricultural supply (AGR) shall not contain concentrations of constituents in excess of the levels specified in Table 3-6.

Groundwaters with a beneficial use of freshwater replenishment shall not contain concentrations of chemicals in amounts that will adversely affect the beneficial use of the receiving surface water.

Groundwaters with a beneficial use of industrial service supply or industrial process supply shall not contain pollutant levels that impair current or potential industrial uses.

To assist dischargers and other interested parties, the Central Valley Regional Board's staff has compiled many numerical water quality criteria from other appropriate agencies and organizations in its staff report, "A Compilation of Water Quality Goals." This staff report is updated regularly to reflect changes in these numerical criteria.

RADIOACTIVITY

At a minimum, groundwaters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

TASTE AND ODOR

Groundwaters designated for use as domestic or municipal supply (MUN) shall not contain taste- or odor-producing substances in concentrations that cause a nuisance or adversely affect beneficial uses. At a minimum, groundwaters designated for use as domestic or municipal supply shall not contain concentrations in excess of the secondary maximum contaminant levels (Secondary MCLs) specified in Tables 64449-A (Secondary MCLs-Consumer Acceptance Limits) and 64449-B (Secondary MCLs-Ranges) of Section 64449 of Title 22 of the California Code of Regulations, which is incorporated by reference into this plan. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. (See Table 3-5.)

OBJECTIVES FOR THE DELTA AND SUISUN MARSH

The objectives contained in the State Board’s “Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh” and any revisions thereto shall apply to the waters of the Sacramento-San Joaquin Delta and Suisun Marsh.

OBJECTIVES FOR ALAMEDA CREEK WATERSHED

The water quality objectives contained in Table 3-7 apply to the surface and groundwaters of the Alameda Creek watershed above Niles.

Wastewater discharges that cause the surface water limits in Table 3-7 to be exceeded may be allowed if they are part of an overall waterwastewater resource operational program developed by those agencies affected and approved by the Regional Board.

TABLE 3-1 WATER QUALITY OBJECTIVES FOR COLIFORM BACTERIA ^a

BENEFICIAL USE	FECAL COLIFORM (MPN /100ML)	TOTAL COLIFORM (MPN/100ML)
Water Contact Recreation	log mean < 200 90th percentile < 400	median < 240 no sample > 10,000
Shellfish Harvesting ^b	median < 14 90th percentile < 43	median < 70 90th percentile < 230 ^c
Non-contact Water Recreation ^d	mean < 2000 90th percentile < 4000	
Municipal Supply: - Surface Water ^e - Groundwater	log mean < 20	log mean < 100 < 1.1 ^f

NOTES:

- a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
- b. Source: National Shellfish Sanitation Program.
- c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.
- d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.
- e. Source: DOHS recommendation.
- f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.

TABLE 3-2 U.S. EPA BACTERIOLOGICAL CRITERIA FOR WATER CONTACT RECREATION^{1,2} (IN COLONIES PER 100 ML)

	FRESH WATER ENTEROCOCCI	FRESH WATER E. COLI	SALT WATER ENTEROCOCCI
Steady State (all areas)	33	126	35
Maximum at:			
- designated beach	61	235	104
- moderately used area	89	298	124
- lightly used area	108	406	276
- infrequently used area	151	576	500

NOTES:

1. The criteria were published in the Federal Register, Vol. 51, No. 45 / Friday, March 7, 1986 / 8012 - 8016. The Criteria are based on:
(a) Cabelli, V.J. 1983. Health Effects Criteria for Marine Recreational Waters. U.S. EPA, EPA 600/1-80-031, Cincinnati, Ohio, and
(b) Dufour, A.P. 1984. Health Effects Criteria for Fresh Recreational Waters. U.S. EPA, EPA 600/1-84-004, Cincinnati, Ohio.
2. The U.S. EPA criteria apply to water contact recreation only. The criteria provide for a level of protection based on the frequency of usage of a given water contact recreation area. The criteria may be employed in special studies within this region to differentiate between pollution sources or to supplement the current coliform objectives for water contact recreation.

TABLE 3-3 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS FOR SURFACE WATERS WITH SALINITIES GREATER THAN 5 PPT ^{a,b}
(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE ^c	1-HR AVERAGE ^c	24-HR AVERAGED	INSTANTANEOUS MAXIMUM ^d
Arsenic	36.0	69.0		
Cadmium	9.3	43.0		
Chromium (VI) ^e	50.0	1100.0		
Copper		f		
Cyanide		5.0		
Lead	5.6	140.0		
Mercury	0.025	2.1		
Nickel ^g			7.1	140.0
Selenium				
Silver				2.3
Tributyltin ^h				
Zinc			58.0	170.0
PAHs ⁱ			15.0	

NOTES:

- a. These objectives shall apply to all estuarine waters within the region, according to the salinity threshold, except for the South Bay below Dumbarton Bridge.
- b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.
- c. Source: U.S. EPA 1984.
- d. Source: U.S. EPA 1980.
- e. This objective may be met as total chromium.

- f. The current U.S. EPA criterion is 2.9 ug/l. However, copper toxicity varies with the complexing capacity of specific receiving waters, and background concentrations in the Bay typically vary from 1 to 4 ug/l. The Regional Board conducted scientific studies on Bay waters between 1986 and 1992 and determined that 4.9 ug/l was a more appropriate value for a site-specific objective, given U.S. EPA's derivation method. U.S. EPA is reviewing that method as part of its national rulemaking for California water quality standards. A site-specific criterion for copper is urgently needed.
- g. The current U.S. EPA criterion is 8.3 ug/l (4-day average).
- h. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, a value of 0.005 ug/l (30-day average) would be protective of human health.
- i. U.S. EPA water quality criteria indicate that 0.031 ug/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10⁻⁶ risk level. PAHs are those compounds identified by EPA Method 610.

**TABLE 3-4 WATER QUALITY OBJECTIVES FOR TOXIC POLLUTANTS
FOR SURFACE WATERS WITH SALINITIES LESS THAN 5 PPT^{a,b}**
(ALL VALUES IN UG/L)

COMPOUND	4-DAY AVERAGE ^c	1-HR AVERAGE ^c	24-HR AVERAGE ^d	INSTANTANEOUS MAXIMUM ^d
Arsenic	190.0	360.0		
Cadmium	e	e		
Chromium (VI) ^f	11.0	16.0		
Copper ^g	6.5	9.2		
Cyanide	5.2	22.0		
Lead	h	h		
Mercury	0.025 ⁱ	2.4		
Nickel	j	j	56.0	1100.0
Selenium				
Silver ^k				1.2
Tributyltin ^l				
Zinc	m	m	58.0	170.0
PAHs ⁿ				

NOTES:

- a. These objectives shall apply to all estuarine and inland surface waters within the region where the salinity is less than 5 ppt, except for the South Bay below Dumbarton Bridge.
- b. The values reported in this table are derived from the 1980 and 1984 U.S. EPA Ambient Water Quality Criteria for salt water and fresh water (unless otherwise specified) and were adopted by the Regional Board in 1986. In 1992, the Regional Board adopted a more inclusive set of objectives reflecting more recent technical information; this set of objectives had been developed and adopted as part of the statewide Inland Surface Waters and Enclosed Bays and Estuaries Plan and was ruled invalid by a court decision in 1993. The U.S. EPA is expected to promulgate final water quality standards for the California in late 1995. The national standards will then apply to all planning, monitoring, NPDES permitting, enforcement, and compliance programs conducted under the Clean Water Act within the state.
- c. Source: U.S. EPA 1984.
- d. Source: U.S. EPA 1980.
- e. The objectives for cadmium and other noted metals are expressed by formulas where $H = \ln(\text{hardness})$ as CaCO_3 in mg/l. The four-day average objective for cadmium is $e^{(0.7852H - 3.490)}$. This is 1.1 µg/l at a hardness of 100 mg/l as CaCO_3 . The one-hour average objective for cadmium is $e^{(1.128H - 3.828)}$. This is 3.9 µg/l at a hardness of 100 mg/l as CaCO_3 .
- f. This limit may be met as total chromium.
- g. The U.S. EPA water quality criteria for copper are hardness-dependent. The current objectives are equivalent to these criteria as calculated for 50 mg/l hardness as CaCO_3 . The four-day average EPA criterion for copper is $e^{(0.8545H - 1.465)}$; the one-hour average criterion is $e^{(0.9422H - 1.464)}$.
- h. The four-day average objective for lead is $e^{(1.273H - 4.705)}$. This is 3.2 µg/l at a hardness of 100 mg/l as CaCO_3 . The one-hour average objective for lead is $e^{(1.273H - 1.460)}$. This is 81 µg/l at a hardness of 100 mg/l as CaCO_3 .
- i. The U.S. EPA Water Quality Criterion for mercury is 0.012 µg/l, which is below the level of detection of 0.025 µg/l. An objective of 0.012 µg/l is desirable, but attainment can only be determined at the level of detection.
- j. The U.S. EPA criteria for nickel are hardness-dependent; the 4-day average criterion is $e^{(0.846H + 1.1645)}$, which is 158 µg/l at a hardness of 100 mg/l as CaCO_3 . The 1-hour average is $e^{(0.846H + 3.3612)}$, which is 1,419 µg/l at a hardness of 100 mg/l as CaCO_3 .
- k. The U.S. EPA water quality criterion for silver is hardness-dependent. This objective is equivalent to these criteria as calculated for 50 mg/l hardness as CaCO_3 . The instantaneous maximum EPA criterion is $e^{(1.72H + 6.52)}$.
- l. Tributyltin is a compound used as an antifouling ingredient in marine paints and toxic to aquatic life in low concentrations (<1 ppb). Based on technical information, values of 0.02 µg/l (4-day average), 0.04 µg/l (24-hour average), and 0.06 µg/l (instantaneous maximum) would be protective of aquatic life.
- m. The U.S. EPA criteria for zinc are hardness-dependent: the 4-day average criterion is $e^{(0.8473H - 0.7614)}$, which is 23 µg/l at a hardness of 100 mg/l as CaCO_3 . The 1-hour average is $e^{(0.8473H - 0.8604)}$, which is 21 µg/l at a hardness of 100 mg/l as CaCO_3 .
- n. U.S. EPA water quality criteria indicate that 0.031 µg/l in both fresh water and salt water is protective of human health, based on setting the acceptable lifetime risk for cancer at the 10^{-6} risk level. PAHs are those compounds identified by EPA Method 610.

TABLE 3-5 WATER QUALITY OBJECTIVES FOR MUNICIPAL SUPPLY

PARAMETER	OBJECTIVE (IN MG/L)
Physical:	
Color (units) ^a	15.0
Odor (number) ^a	3.0
Turbidity (NTU) ^a	5.0
pH ^b	6.5
TDS ^c	500.0
EC (mmhos/cm) ^c	0.9
Corrosivity	non-corrosive

Inorganic Parameters:

Aluminum ^d	1.0 ^d / 0.2 ^a
Antimony ^d	0.006
Arsenic ^d	0.05
Asbestos ^d	7 MFL ^e
Barium ^d	1.0
Beryllium ^d	0.004
Chloride ^c	250.0
Cadmium ^d	0.005
Chromium ^d	0.05
Copper ^a	1.0
Cyanide ^d	0.2
Fluoride ^f	0.8-1.7 ^g
Iron ^a	0.3
Lead ^b	0.05
Manganese ^a	0.05
Mercury ^d	0.002
Nickel ^d	0.1
Nitrate (as NO ₃) ^d	45.0
Nitrate + Nitrite (as N) ^d	10.0
Nitrite (as N) ^d	1.0
Selenium ^d	0.05
Silver ^b	0.05
Sulfate ^c	250.0
Thallium ^d	0.002
Zinc ^a	5.0

Organic Parameters:

MBAS (Foaming agents) ^a	0.5
Oil and grease ^b	none
Phenols ^b	0.001
Trihalomethanes ^b	0.1

Chlorinated Hydrocarbons:

Endrin ^h	0.002
Lindane ^h	0.0002
Methoxychlor ^h	0.04
Toxaphene ^h	0.003
2,3,7,8-TCDD (Dioxin) ^h	3 x 10 ⁻⁸
2,4-D ^h	0.07
2,4,4-TP Silvex ^h	0.05

Synthetics:

Alachlor ^h	0.002
Atrazine ^h	0.003
Bentazon ^h	0.018
Benzo(a)pyrene ^h	0.0002
Dalapon ^h	0.2
Dinoseb ^h	0.007
Diquat ^h	0.02
Endothal ^h	0.1

PARAMETER	OBJECTIVE (IN MG/L)
Benzene ^h	0.001
Carbon Tetrachloride ^h	0.0005
Carbofuran ^h	0.018
Chlordane ^h	0.0001
1,2-Dibromo-3-chloropropane ^h	0.0002
1,2-Dichlorobenzene ^h	0.6
1,4-Dichlorobenzene ^h	0.005
1,1-Dichloroethane ^h	0.005
1,2-Dichloroethane ^h	0.0005
cis-1,2-Dichloroethylene ^h	0.006
trans-1,2-Dichloroethylene ^h	0.01
1,1-Dichloroethylene ^h	0.006
Dichloromethane ^h	0.005
1,2-Dichloropropane ^h	0.005
1,3-Dichloropropene ^h	0.0005
Di (2-ethylhexyl) adipate ^h	0.4
Di(2-ethylhexyl) phthalate ^h	0.004
Ethylbenzene ^h	0.7
Ethylene dibromide ^h	0.00005
Glyphosate ^h	0.7
Heptachlor ^h	0.00001
Heptachlor epoxide ^h	0.00001
Hexachlorobenzene ^h	0.001
Hexachlorocyclopentadiene ^h	0.05
Molinate ^h	0.02
Monochlorobenzene ^h	0.07
Oxaryl ^h	0.2
Pentachlorophenol ^h	0.001
Picloram ^h	0.5
Polychlorinated Biphenyls ^h	0.0005
Simazine ^h	0.004
Styrene ^h	0.1
1,1,2,2-Tetrachloroethane ^h	0.001
Tetrachloroethylene ^h	0.005
Thiobencarb ^h	0.001
1,2,4-Trichlorobenzene ^h	0.07
1,1,1-Trichloroethane ^h	0.2
1,1,2-Trichloroethane ^h	0.005
Trichloroethylene ^h	0.005
Trichlorofluoromethane ^h	0.15
1,1,2-Trichloro-1,2,2-trifluoroethane ^h	1.2
Toluene ^h	0.15
Vinyl chloride ^h	0.0005
Xylenes (single or sum of isomers) ^h	1.75

PARAMETER	OBJECTIVE (IN pCi/l)
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Radioactivity:

Combined Radium-226 and Radium-228 ⁱ	5
Gross Alpha Particle Activity ^j	15 ^j
Tritium ⁱ	20,000
Strontium-90 ^j	8
Gross Beta Particle Activity ^j	50
Uranium ⁱ	20

NOTES:

- Secondary Maximum Contaminant Levels as specified in Table 64449-A of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Table III-2, 1986 Basin Plan.
- Secondary Maximum Contaminant Levels as specified in Table 64449-B of Section 64449, Title 22 of the California Code of Regulations, as of June 19, 1995. (Levels indicated are "recommended" levels. Table 64449-B contains a complete list of upper and short-term ranges.)
- Maximum Contaminant Levels as specified in Table 64431-A (Inorganic Chemicals) of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
- MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.
- Flouride objectives depend on temperature.
- A complete list of optimum and limiting concentrations is specified in Table 64431-B of Section 64431, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Maximum Contaminant Levels as specified in Table 64444-A (Organic Chemicals) of Section 64444, Title 22 of the California Code of Regulations, as of June 19, 1995.
- Maximum Contaminant Levels as specified in Table 4 (Radioactivity) of Section 64443, Title 22 of the California Code of Regulations, as of December 22, 1988.
- Includes Radium-226 but excludes Radon and Uranium.

TABLE 3-6 WATER QUALITY OBJECTIVES FOR AGRICULTURAL SUPPLY ^a**(IN MG/L)**

PARAMETER	THRESHOLD	LIMIT	LIMIT FOR LIVESTOCK WATERING
Physical:			
pH	5.5-8.3	4.5-9.0	
TDS			10,000.0
EC (mmhos/cm)		0.2-3.0	
Inorganic Parameters:			
Aluminum	5.0	20.0	5.0
Arsenic	0.1	2.0	0.2
Beryllium	0.1	0.5	
Boron	0.5	2.0	5.0
Chloride	142.0	355.0	
Cadmium	0.01	0.5	0.05
Chromium	0.1	1.0	1.0
Cobalt	0.05	5.0	1.0
Copper	0.2	5.0	0.5
Fluoride	1.0	15.0	2.0
Iron	5.0	20.0	
Lead	5.0	10.0	0.1
Lithium		2.5 ^b	
Manganese	0.2	10.0	
Molybdenum	0.01	0.05	0.5
Nickel	0.2	2.0	
NO ₃ + NO ₂ (as N)	5.0	30 ^c	100.0
Selenium		0.02	0.05
Sodium adsorption ratio (adjusted) ^d	3.0	9.0	
Vanadium	0.1	1.0	0.1
Zinc	2.0	10.0	25

NOTES:

a. For an extensive discussion of water quality for agricultural purposes, see "A Compilation of Water Quality Goals," Central Valley Regional Water Quality Control Board, May 1993.

b. For citrus irrigation, maximum 0.075 mg/l.

c. For sensitive crops. Values are actually for NO₃-N + NH₄-N.

d. Adjusted SAR = [Na / (Ca+Mg) 1/2][1+(8.4-pHc)] where pHc is a calculated value based on total cations, 2 Ca + Mg+ CO₃ + HCO₃, in me/l. Exact calculations of pHc can be found in "Guidelines for Interpretation of Water Quality for Agriculture" prepared by the Univ. of California Cooperative Extension.

**TABLE 3-7 WATER QUALITY OBJECTIVES FOR
THE ALAMEDA CREEK WATERSHED ABOVE NILES**

SURFACE WATER QUALITY OBJECTIVES (ALAMEDA CREEK AND TRIBUTARIES)

TDS: 250 mg/l (90 day-arithmetic mean)
360 mg/l (90 day-90th percentile)
500 mg/l (daily maximum)

Chlorides: 60 mg/l (90 day-arithmetic mean)
100 mg/l (90 day-90th percentile)
250 mg/l (daily maximum)

GROUNDWATER QUALITY OBJECTIVES

(Concentration not to be exceeded more than 10 percent of the time during one year.)

Central Basin

TDS: Ambient or 500 mg/l, whichever is lower
Nitrate (NO₃): 45 mg/l

Fringe Subbasins

TDS: Ambient or 1000 mg/l, whichever is lower
Nitrate (NO₃): 45 mg/l

Upland and Highland Areas

California domestic water quality standards set forth in California Code of Regulations, Title 22, and current county standards.

Ambient water quality conditions at a proposed project area will be determined by Zone 7 of the Alameda County Flood Control and Water Conservation District at the time the project is proposed, with the cost borne by the project proponents. Ambient conditions apply to the water-bearing zone with the highest quality water.

Waters designated for use as domestic or municipal water supply shall not contain concentrations of chemicals in excess of natural concentrations or the limits specified in California Code of Regulations, Title 22, Chapter 15, particularly Tables 64431-A and 64431-B of Section 64431, Table 64444-A of Section 64444, and Table 4 of Section 64443.